(5) OCT 2 1991 STAR ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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Tank Integrity Assessments Waste Tanks/Engineering & Projects	J.A. Eacker	N/A

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1		Activity Manager (J.D. Thomson)		10/24/91	R1-30	J.L. Deichman			H4-23	3	
5		QA (D.C. Board)			S1-57	K.V. Scott			H5-52	3	
5		Safety (M.N. Islam)			R3-08						
5		Env. (B.G. Erlandson)			B2-19						
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3		S. Marchetti			R2-50						

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J.A. Eacker 10/15/91	J.A. Eacker 10/15/91	J.A. Eacker	[] Approved [] Approved w/comments [] Disapproved w/comments
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Tank Integrity Assessments Program Plan

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7. Abstract

This program plan outlines the activities that will occur in the performance of the integrity assessments for facilities assigned to the Tank Farm Project. These assessments are required under the Resource Conservation and Recovery Act for all tank systems that store hazardous wastes. Specific Tank Farm Project facilities for which performance of an integrity assessment must be addressed include:

Double-Shell Tank System
242-A Evaporator Facility
Single-Shell Tank System

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Tank Farm Project

Tank Integrity Assessments

Program Plan

WHC-SD-WM-AP-017

REV. 0

Tank Farms Environmental Engineering

October 1991

EXECUTIVE SUMMARY

This program plan outlines the activities that will occur in the performance of the integrity assessments for facilities assigned to the Tank Farm Project. These assessments are required under the Resource Conservation and Recovery Act for all tank systems that store hazardous wastes. Specific Tank Farm Project facilities for which performance of an integrity assessment must be addressed include:

Double-Shell Tank System
242-A Evaporator Facility
Single-Shell Tank System

The performance of an integrity assessment on a tank system is not generally a complex evolution. Radiological and design concerns make performance of this task on the Tank Farm Project facilities more unique. Major tasks that will be addressed in the various integrity assessments include:

Design standard structural integrity assessment
Waste characteristics, compatibility and corrosion protection
Testing and Examinations

The completion of these integrity assessments will ensure that the tank systems are fit for use. The assessment will also identify what continued integrity assessment program is required for continued operation. The results of the assessments will be approved by the operator of the facility and will be certified by an independent, qualified registered professional engineer.

An integrity assessment will not be performed on the Single-Shell Tank system as this facility is no longer in use and is pursuing closure. This program plan identifies the tasks that are being performed to comply with the RCRA requirements for disposition of an unfit for use system.

TABLE OF CONTENTS

TANK FARM PROJECT
TANK INTEGRITY ASSESSMENTS
PROGRAM PLAN

1.0 INTRODUCTION

The Waste Tank Safety, Operations and Remediation Organization within Westinghouse Hanford Company (WHC) operates facilities within the Tank Farm Project for the U.S. Department of Energy Field Office, Richland (RL). For the purposes of this plan, the Tank Farm facilities include the Single-Shell Tanks, Double-Shell Tanks, and the 242-A Evaporator facility. These facilities are classified as Treatment, Storage, and Disposal facilities for hazardous wastes under the Resource Conservation and Recovery Act (RCRA). One of the provisions of the RCRA program is the assessment of the integrity of tank systems. This program plan addresses the performance of the integrity assessment for tank systems associated with the Tank Farm Project.

An integrity assessment on a tank system is not in itself a complex task. Several important factors make performance of this task on the facilities in the Tank Farm Project more unique:

- The facilities store radioactive mixed waste which inherently raises exposure and safety issues that must be addressed for all operations

- The facilities are primarily located underground which leads to access and operational difficulties when performing assessments that the facilities were not specifically designed to accommodate

- The facilities were designed and constructed over a 40 year period from the 1940's to the 1980's. This leads to a significant number of designs, design standards, and materials of construction that must be addressed.

An integrity assessment of this scope and magnitude has not been undertaken on the Hanford Site to date.

2.0 BACKGROUND

2.1 REGULATORY DISCUSSION

Liquid waste is generated throughout the Hanford Site during processing, treatment and disposal operations. The various Tank Farm facilities serve as the temporary repository for these wastes. The wastes that are stored include hazardous components that are regulated under RCRA as well as by-product material that is regulated under the Atomic Energy Act.

2.1.1 Applicability of Regulation

The Single-Shell Tanks (SSTs), Double-Shell Tanks (DST), and the 242-A Evaporator are all classified as Treatment, Storage and Disposal (TSD) waste management units and are operated under the Interim Status provisions of RCRA. Under the authority of RCRA, the State of Washington Department of Ecology has promulgated Dangerous Waste Regulations (WAC 173-303). These regulations incorporate the provisions of RCRA and provide the regulatory direction for the management of dangerous wastes in the State of Washington. These regulations are applicable to the hazardous portion of the wastes stored in the various facilities of the Tank Farms Project.

2.1.2 Integrity Assessment Regulation

The provision for integrity assessments of tank systems is provided in the Washington Administrative Code (WAC), Section 173-303-640(2)(a). This section of the WAC states:

> "For each existing tank system, the owner or operator must determine that the tank system is not leaking or is unfit for use. Except as provided in (b) of this subsection, the owner or operator must obtain and keep on file at the facility a written assessment reviewed and certified by an independent, qualified registered professional engineer, in accordance with WAC 173-303-810(13)(a), that attests to the tank system's integrity by January 12, 1988, for underground tanks that do not meet the requirements of subsection (4) of this section and that cannot be entered for inspection, or by January 12, 1990, for all other tank systems."

The provision for an ongoing integrity assessment program for tanks systems is addressed in WAC 173-303-640(2)(e). This section of the WAC states:

> "The owner or operator must develop a schedule for conducting integrity assessments over the life of the tank to ensure that the tank retains its structural integrity and will not collapse, rupture, or fail. The schedule must be based on results of past integrity assessments, age of the tank system, materials of construction, characteristics of the waste, and any other relevant factors."

These Washington State requirements are derived from the RCRA requirements for integrity assessments as provided in 40 CFR 265.191(a).

2.2 FACILITY DESCRIPTION

A total of 177 single and double-shell tanks have been constructed in the 200 East and 200 West Areas of the Hanford Site. These facilities were constructed to various designs from 1943 to 1986. The combination of these tanks along with various transfer, receiving, and treatment facilities comprise the Tank Farms Project. An overview of the various facilities is shown in Figure 2-1 (East Area) and Figure 2-2 (West Area).

2.2.1 Double-Shell Tank System (DST)

The DST system is an arrangement of tanks and transfer facilities designed for the storage of radioactive mixed liquid wastes. This system is comprised of several types of components including large storage tanks (DSTs), smaller intermediate storage tanks (double contained receiver tanks or DCRTs), and various transfer and routing facilities.

The DST system contains a total of 28 DSTs that are separated into six specific groups (or farms). These farms include 241-AN (7 DSTs), 241-AP (8 DSTs), 241-AW (6 DSTs), 241-AY (2 DSTs), 241-AZ (2 DSTs) and 241-SY (3 DSTs). The AN, AP, AW, AY, and AZ Tank Farms are located in the 200 East Area, while the SY Tank Farm is located in the 200 West Area.

2.2.1.1 Tank Description

The DSTs have a nominal 1,000,000 gallon storage volume and are basically of the same construction. The tanks consist of the following three concentric structures (as shown in Figure 2-3):

-An outer, reinforced concrete tank designed to sustain soil loads, dead loads, live loads, seismic loads, and loads caused by thermal gradients between the radioactive wastes and the outside soil

-A secondary carbon steel tank that lines the concrete tank and is designed to serve as a leak barrier

-A free-standing carbon steel primary tank resting on an insulating concrete pad within the secondary tank.

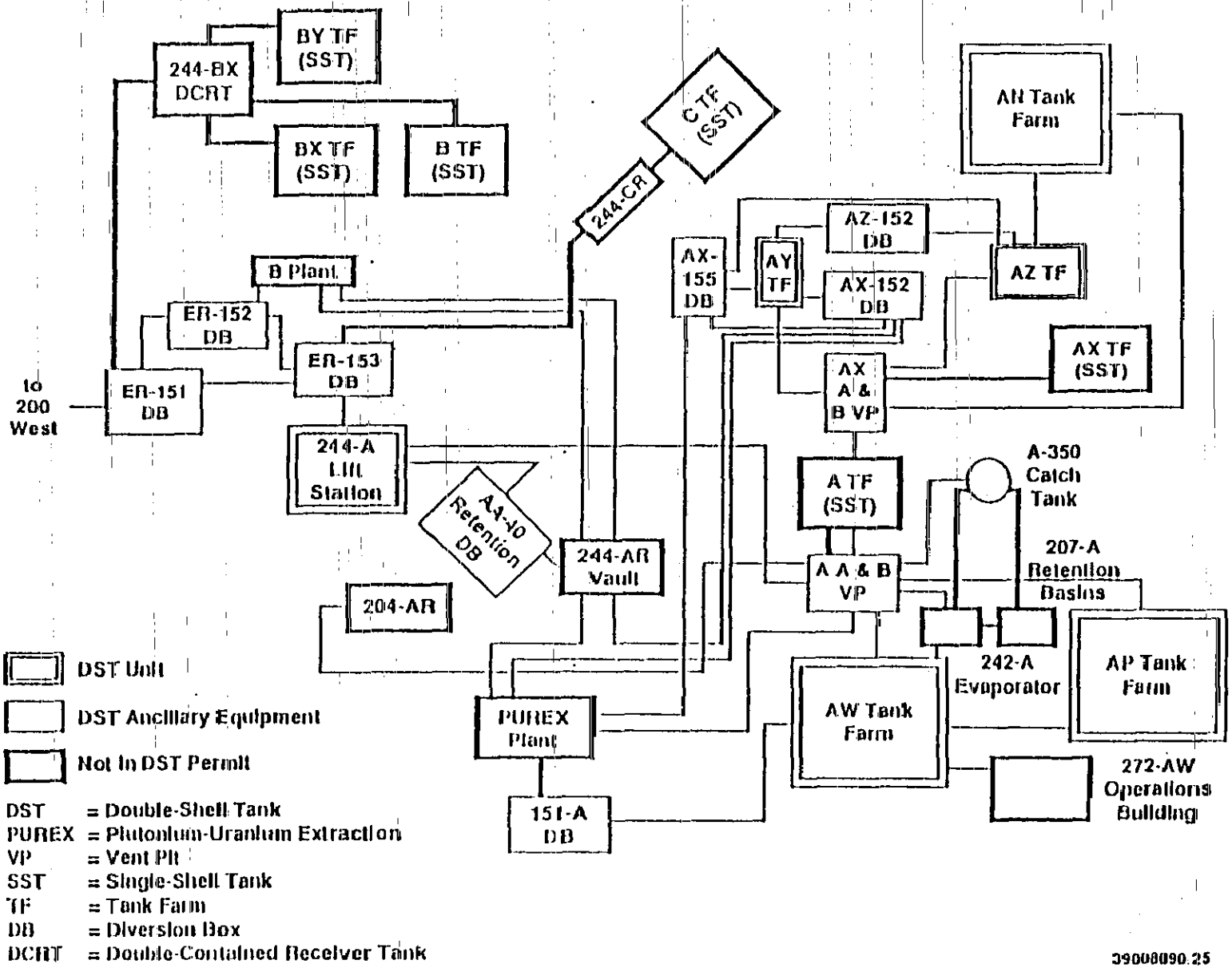

BY TF (SST)
244-BX DCRT
BX TF (SST)
B TF (SST)
C TF (SST)
244-CR
AN Tank Farm
AZ-152 DB
AX-155 DB
AY TF
AX-152 DB
AZ TF
B Plant
ER-152 DB
ER-153 DB
AX TF (SST)
to 200 West
ER-151 DB
AX A & B VP
244-A Lift Station
A-350 Catch Tank
A TF (SST)
AA-40 Retention DB
244-AR Vault
207-A Retention Basins
A A & B VP
204-AR
242-A Evaporator
AP Tank Farm
PUREX Plant
AW Tank Farm
272-AW Operations Building
151-A DB
DST Unit
DST Ancillary Equipment
Not In DST Permit
DST = Double-Shell Tank
PUREX = Plutonium-Uranium Extraction
VP = Vent Pit
SST = Single-Shell Tank
TF = Tank Farm
DB = Diversion Box
DCRT = Double-Contained Receiver Tank
39000090.25

Figure 2-1

200 West Area Piping Flow Diagram

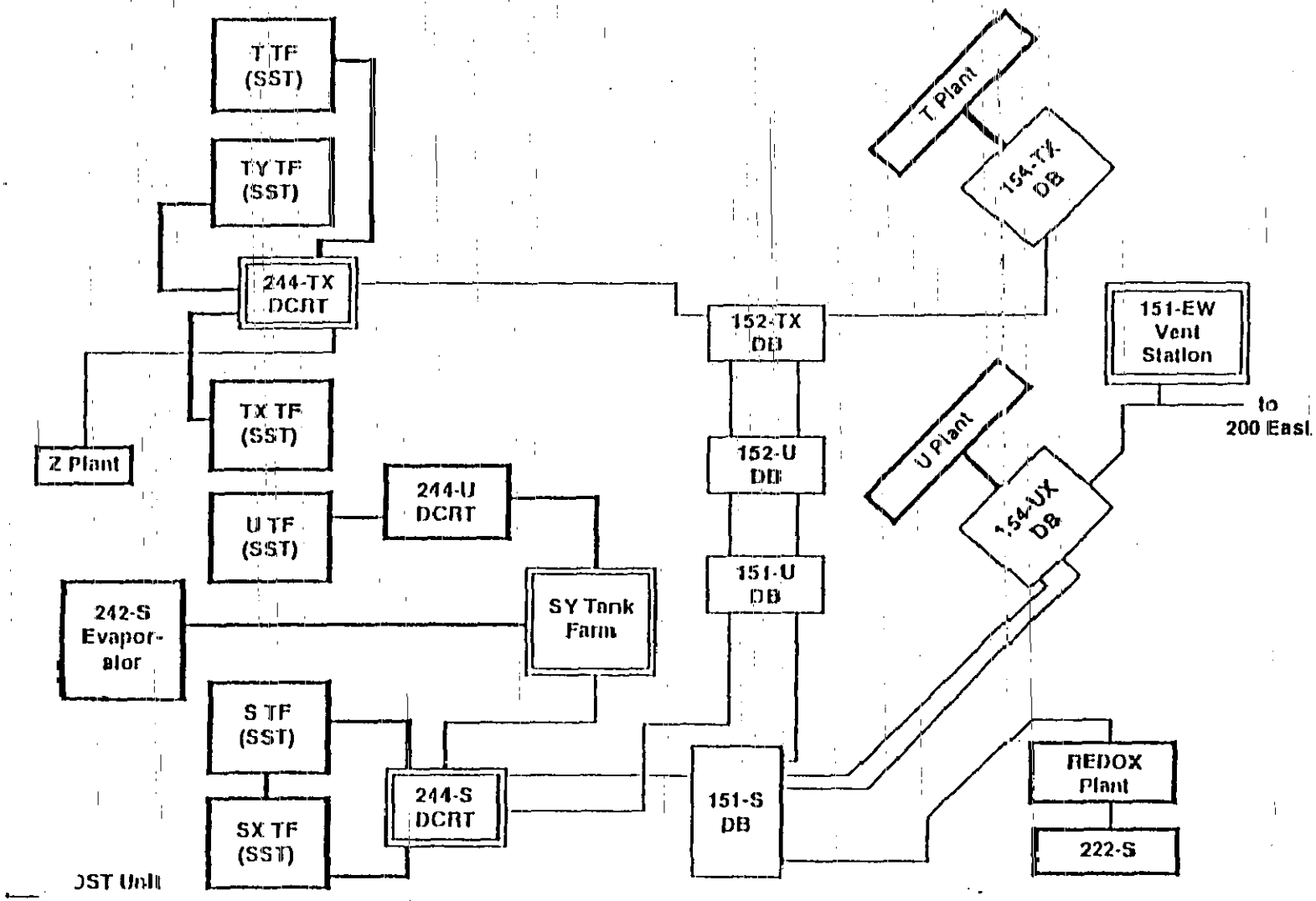


Figure 2-2

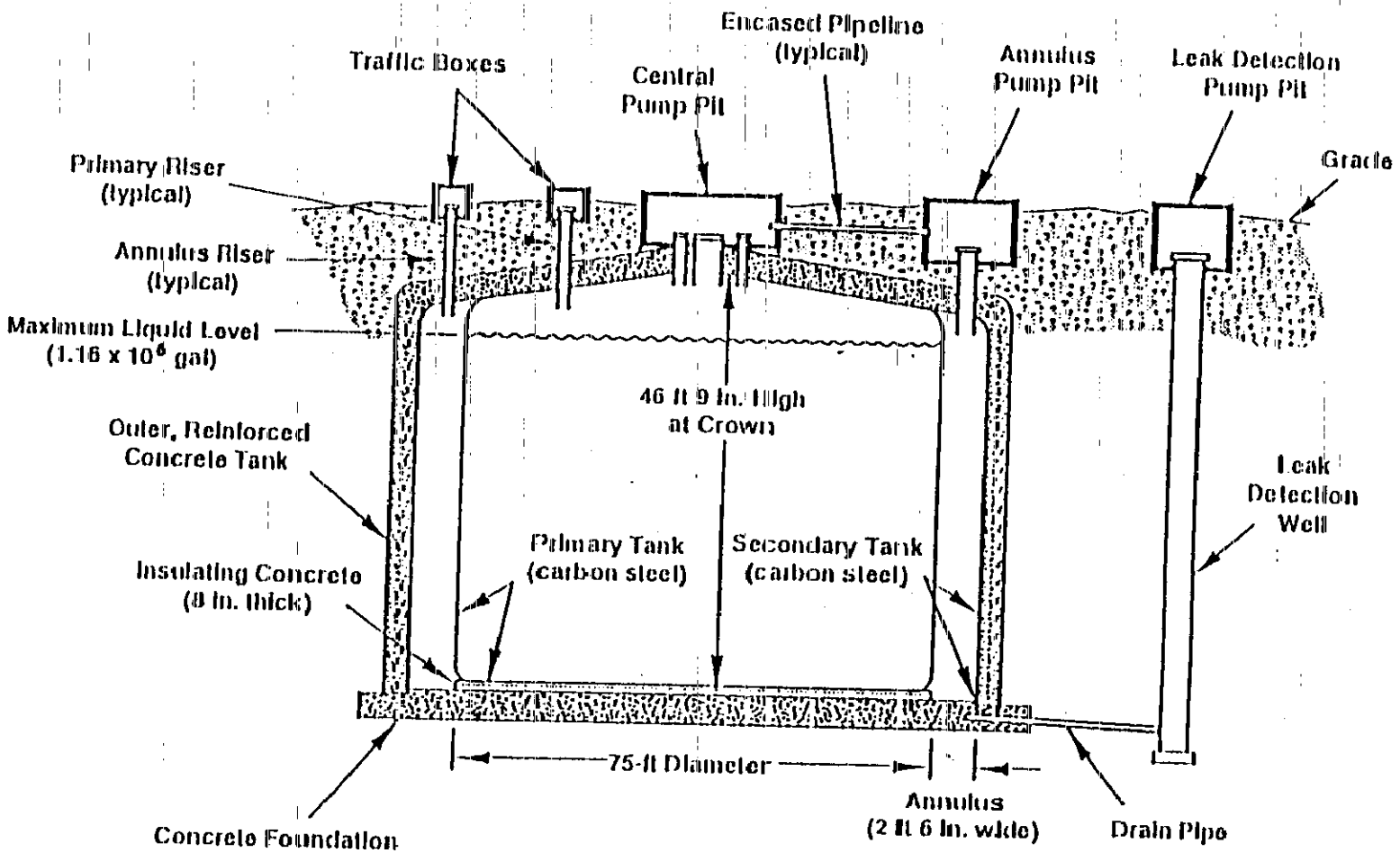


Figure 2-3

The primary tank contains the waste material. The secondary tank, which is 5 ft larger in diameter than the primary tank, encloses the primary tank to create a surrounding space called the annulus. The completely enclosed annulus serves as the containment barrier for primary tank leaks. The annulus is ventilated and constantly monitored for evidence of primary tank leakage. If a leak should occur, the secondary tank will contain the liquid waste until it can be removed and stored in a different tank.

Each tank has several risers extending vertically from the tank dome into pits or above-grade level. The risers are made of various size pipes and some have blind flanges installed. They are used as tank access points for monitoring devices, observation points, sample ports, and sludge measurements.

Process pits are the underground structure where risers terminate allowing various process operations to be performed. These pits provide the access point for such equipment as process piping, transfer routing jumpers, and pump control equipment. The following is a general listing of these types of pits that are common to the various Tank Farms:

- Central pump pits
- Annulus pump pits
- Feed pump pits
- Drain pits

2.2.1.2 Ancillary Equipment Description

A network of underground pipelines is used to move waste throughout the DST system. Transfer routes in the system are utilized for: transporting waste to and from the 242-A Evaporator, transferring material between tanks, and receiving waste from process facilities. This network of transfer facilities is located throughout the 200 East and 200 West Areas on the Hanford Site. There is also a cross-site transfer route connecting the 200 East and 200 West Areas.

Process piping consists of various types of piping installed over the life of the facility. Various sizes and designs of piping are utilized for transporting slurry, supernate, process waste and drainage. Piping materials vary from carbon steel to stainless steel depending upon the application. Types of secondary containment for the pipelines include pipe in pipe, pipe in concrete encasement, and direct buried pipe (no secondary containment).

The facilities used for waste transfers in the DST system include process pits along with diversion boxes, valve pits, and transfer boxes. A brief generic description of each of these facilities is provided below.

Diversion Boxes. A diversion box is a below-grade concrete box used for directing waste from one point to other points in the DST system. This is accomplished by connecting movable jumper pipes to stationary connecting nozzles in the box. Each connecting nozzle is the inlet or outlet of a transfer pipeline that runs to different DST facilities. Transfer routes can be changed by removing the concrete cover blocks from the diversion box and reconnecting the jumpers to different nozzles.

Valve Pits. The major difference between valve pits and diversion boxes is that the jumper pipes have valves. The valves in the jumper pipes allow for routing changes without removing the cover blocks or moving the jumpers. Valve handles extend up through holes in the cover blocks.

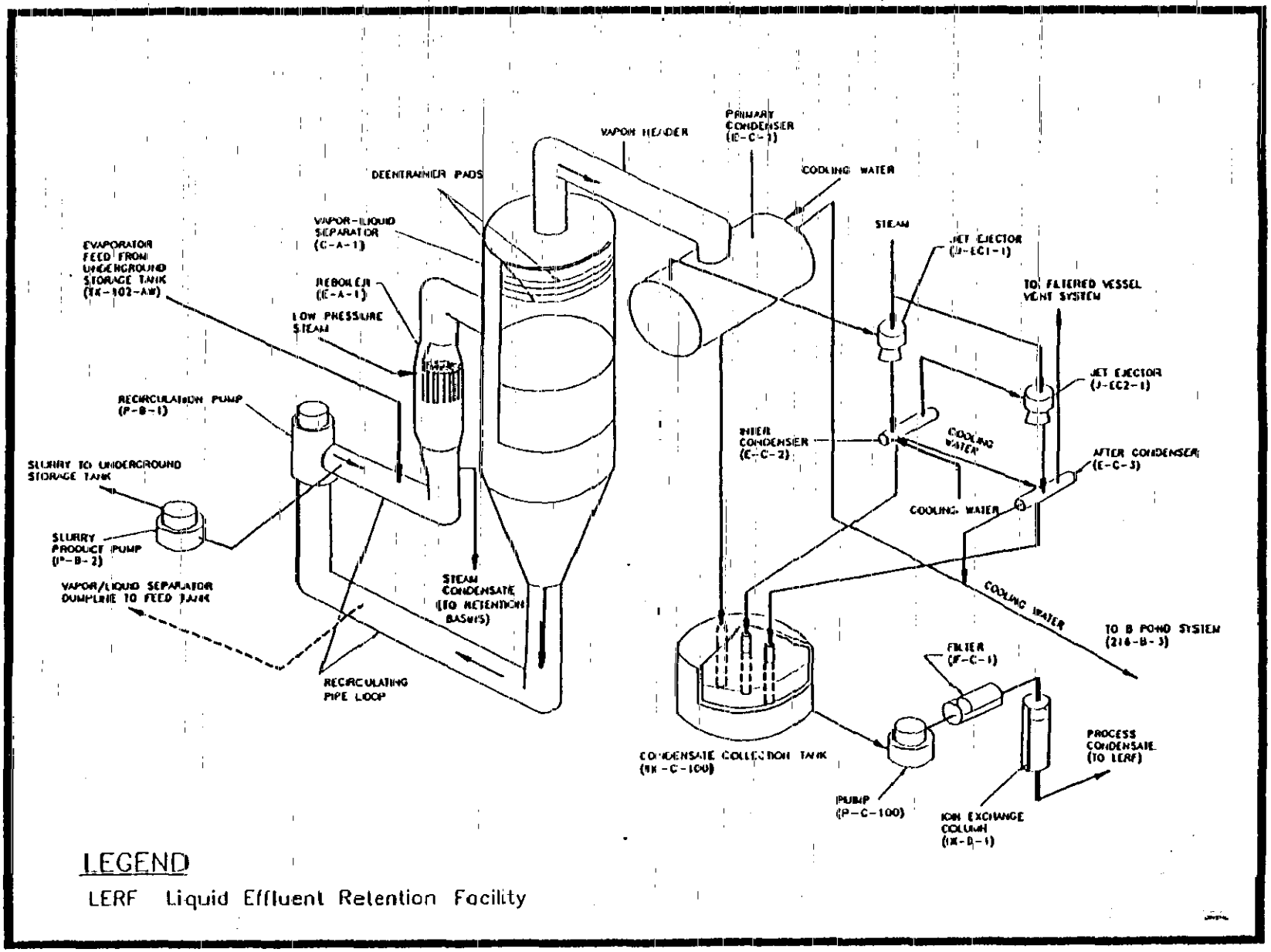
Transfer Boxes. A transfer box is a diversion box that connects a common transfer line to each of several other lines one at a time. Connecting nozzles are arranged in a semi-circle around the common nozzle. Jumper pipes are necessary to connect the common nozzle to the outgoing transfer nozzle.

All of the routing facilities described above have floor drains to prevent the buildup of contaminated waste from spills and leaks. The waste is drained from the concrete boxes to catch tanks, catch stations, or, in some cases, DSTs.

2.2.2 242-A Evaporator System

The 242-A Evaporator is a treatment facility located in the 200 East Area that is operated to separate mixed waste from the DSTs into two separate streams. DST waste is concentrated in the evaporator and a slurry product is returned to the DST system. The overheads from the evaporation process are then condensed and will be stored at the Liquid Effluent Retention Facility (LERF) until a condensate treatment facility is operational. The operation of the evaporator also limits the volume of storage capacity required in the DST system.

The 242-A Evaporator process employs a conventional forced circulation, vacuum evaporation system to concentrate mixed waste solutions. The main process components of the evaporator system are located in the 242-A Evaporator buildings. The components include the reboiler, vapor-liquid separator, recirculation pump and pipe loop, slurry pump, condensers, jet vacuum system, condensate collection tank, and ion exchange system. Figure 2-4 provides a simplified schematic diagram of the evaporator process components.



LEGEND

LERF Liquid Effluent Retention Facility

Figure 2-4

2.2.3 Single-Shell Tank System

The Single-Shell Tank System consists of a number of storage and transfer facilities that are located throughout the 200 East and 200 West Areas of the Hanford Site. A total of 149 SSTs were constructed between 1943 and 1964. These tanks are located in 12 separate groupings referred to as Tank Farms. One hundred thirty-three of the SSTs are 75 ft in diameter with nominal capacities of 530,000 to 1,000,000 gallons. Sixteen of the tanks are smaller units of a similar design with a 20-ft diameter and 55,000 gallon capacity. The large SSTs are reinforced concrete, cylindrical, dome-roofed, buried tanks with a single steel liner across the bottom and up the walls. Surface loads, static and dynamic soil loads, and hydrostatic and hydrodynamic loads are carried by the reinforced concrete tank and dome. The steel liner provides containment for the liquid waste.

3.0 SCOPE AND OBJECTIVES

3.1 OBJECTIVES OF PROGRAM PLAN

The objective of this program plan is to describe the methods for performance of integrity assessments for the Tank Farm Project. The activities described in the plan are intended to complete the required assessments in a timely manner and within programmatic constraints.

3.2 SCOPE OF INTEGRITY ASSESSMENT FOR DOUBLE-SHELL TANKS

The DST facilities were assessed for compliance with the secondary containment requirements identified by WAC 173-303-640(4). The results of this assessment (WHC-SD-WM-EV-040) identified that the design of the DSTs was adequate to meet the secondary containment requirements. The designs for a number of the transfer facilities, however, failed to comply with the secondary containment requirements. The significant discrepancies lie in various transfer facilities such as catch tanks, transfer pipelines, diversion boxes, and drain and seal pot piping. An engineering study was performed on each of these facilities to determine potential options to bring the existing facilities into compliance:

WHC-SD-WM-ES-156 Engineering Study	Catch Tanks Environmental Upgrade for Tank Farms
WHC-SD-WM-ES-160 Engineering Study	Transfer Lines Environmental Upgrade for Tank Farms
WHC-SD-WM-ES-159 Engineering Study	Diversion Boxes Environmental Upgrades for Tank Farms
WHC-SD-WM-ES-157 Engineering Study	Seal Pots and Associated Drain Piping Environmental Upgrades for Tank Farms

The results of these engineering studies identified that replacement in kind for the non-compliant systems would be expensive and not efficient. For this reason, secondary containment issues for the DST facilities were incorporated into the "Tank Farm Upgrades Strategic Plan", WHC-EP-0392. This plan discusses physical changes that are necessary to bring the Tank Farms Project into compliance with various requirements (including RCRA) and serves as a basis for future construction projects. Implementation of these upgrades will bring the DST system into compliance with the RCRA secondary containment requirements.

A single all-encompassing integrity assessment for the DST system is not possible at this time due to the known non-compliances that exist. For this reason a two phased approach will be utilized in performing the integrity assessment. These two phases include:

1) Assessing the integrity of the DSTs and associated transfer facilities that are designed with adequate secondary containment. The tanks and ancillary equipment that will be included in the initial integrity assessment are listed in appendix A.

2) Assessing the integrity of replacements to existing transfer facilities that do not have adequate secondary containment. The replacement projects will include performance of an integrity assessment as part of the acceptance of the project.

Interim controls for transfer facilities that are non-compliant for the secondary containment requirements will rely on appropriate operational testing performed prior to and during transfers. Mass balances and leak detection for transfers inside the DST system ensure that the ongoing transfers are accomplished safely. Leak testing of transfer piping that has not been utilized within the previous year is another means that is utilized to ensure the integrity of some DST transfer routes.

Documentation for each part of the overall integrity assessment will be approved by an independent, qualified registered professional engineer (IQRPE) and maintained on file. When the required secondary containment upgrades to the DST system have been completed, a file will exist that demonstrates the overall system has met the integrity assessment requirement.

3.3 SCOPE OF INTEGRITY ASSESSMENT FOR THE 242-A EVAPORATOR

The 242-A Evaporator consists of process vessels and support systems designed to heat, evaporate, and condense the DST waste. For permitting purposes, the 242-A Evaporator (with the exception of the condensate collection tank) has been classified as a miscellaneous unit and is being permitted under the provisions of the U.S. Environmental Protection Agency (EPA) regulations provided in Subpart X of 40 CFR 264. Subpart X requires that miscellaneous permit terms and conditions address the appropriate requirements provided for other treatment, storage, and disposal units.

The design and operation of the 242-A Evaporator most closely resembles that of a tank system; therefore, appropriate requirements prescribed for a tank system are addressed in the operation of the facility. One of these conditions includes performance of an integrity assessment for the facility and its associated tank system. This assessment will be performed on those components in the 242-A Evaporator system that are deemed to resemble a tank system.

3.4 SCOPE OF INTEGRITY ASSESSMENT FOR SINGLE-SHELL TANKS

The Single-Shell Tank system is permitted under interim status as a storage facility including an identification of tank storage. This identification requires that all of the SSTs and their associated ancillary equipment be assessed as part of an integrity assessment. The SSTs are currently pursuing closure as part of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement). For this reason, an integrity assessment will not be performed on these facilities.

3.4.1 Single-Shell Tank Waste Removal

The SSTs are known to have questionable integrity, in fact a number have been declared assumed leakers. With this in mind it has been determined that the appropriate response is to take actions required for tank systems of questionable integrity. The regulation concerning the required response to a leaking or unfit-for-use tank system is found in WAC 173-303-640(7). The regulation states the following:

> "A tank system or secondary containment system from which there has been a leak or spill, or which is unfit for use, must be removed from service immediately, and the owner or operator must satisfy the following requirements:
>
> (a) Cessation of use; prevent flow or addition of wastes. The owner or operator must immediately stop the flow of dangerous waste into the tank system or secondary containment system and inspect the system to determine the cause of the release.
>
> (b) Removal of waste from the tank system or secondary containment system.
>
> (i) If the release was from the tank system, the owner/operator must, within twenty-four hours after detection of the leak or, if the owner/operator demonstrates that it is not possible, at the earliest practicable time, remove as much of the waste as is necessary to prevent further release of dangerous waste to the environment and to allow inspection and repair of the tank system to be performed."

For this reason the SSTs have not received new wastes since 1981. The only ongoing storage activities are interim stabilization (removal of liquids) and interim isolation of the tanks. A compliance plan for removal of liquid wastes (through stabilization) at the earliest practical time is identified in

Tri-Party Agreement Milestone M-05-00. The M-05-00 milestone reads as follows:

M-05-00 Complete single-shell tank interim stabilization

Complete the single-shell tank interim stabilization activities (removal of pumpable liquid from those 51 single-shell tanks not yet stabilized) for all single-shell tanks except 241-C-105 and 241-C-106 by September 1995. All 149 tanks, including 241-C-105 and 241-C-106 will be interim stabilized and interim isolated by September 1996. Interim isolation seals all portals into single-shell tanks.

The removal of the liquid waste minimizes the potential for migration of materials in leaking tanks to reach the environment. Removal of solids, if required, will be performed as part of the closure activities.

3.4.2 Single-Shell Tank Closure

Following the removal of the waste from the unfit-for-use tank system, the WAC 173-303-640(7) continues in a discussion of repair and/or closure:

(e) Provision of secondary containment, repair, or closure.
(i) Unless the owner/operator satisfies the requirements of (e)(ii) through (iv) of this subsection, the tank system must be closed in accordance with subsection (8) of this section."

The SST system is progressing into closure and a compliance plan has been identified as part of the Tri-Party Agreement. Milestone M-09-00 states:

M-09-00 Complete closure of all 149 single-shell tanks

Closure and removal of required waste from the 149 single-shell tanks will be effected in accordance with the approved closure plan(s). As stated in the Hanford Defense Waste Environmental Impact Statement Record of Decision, a supplemental EIS will be prepared prior to making any final decisions regarding the disposal of single-shell tank waste. The final closure plan(s) will address the recommendations of the supplemental EIS.

4.0 PROGRAM PLAN TASKS

4.1 DOUBLE-SHELL TANK INTEGRITY ASSESSMENT

The performance of the initial integrity assessment of the Double-Shell Tank (DST) system involves the following major tasks:

Integrity assessment planning
Design standards - structural integrity review
Waste characteristics, compatibility and corrosion review
Leak testing and examinations
Integrity assessment report preparation

Each of these tasks is described in more detail in the following sections.

4.1.1 Integrity Assessment Planning

An integrity assessment plan (IAP) will be written for each of the following discrete portions of the DST system:

241-AW Tank Farm (WHC-SD-WM-WP-057)
Double Contained Receiver Tanks (WHC-SD-WM-WP-068)
241-AN Tank Farm
241-AP Tank Farm
241-AY/AZ Tank Farms
241-SY Tank Farm

Each IAP will describe the components to be assessed and the examinations, tests, analyses, data management and reporting required to complete that assessment. The IAPs will be approved by the operator of the facility and approved by an IQRPE.

4.1.2 Design Standard - Structural Integrity Assessment

Structural integrity of the tanks and ancillary equipment will be assessed by comparing standards utilized for the design of the tank system against current design standards. Differences that may influence the structural integrity of the tank system will be evaluated. Technical differences will be dispositioned through engineering analysis of the variances or through upgrades to the facilities.

4.1.3 Waste Characteristics, Compatibility and Corrosion Review

A combination of material behavior analysis and historical data will be utilized in assessing whether the tank system has not experienced general corrosion or stress corrosion cracking damage from the wastes (total compatibility) or experiences damage at a slow rate (tank system components have a finite life). The range of waste component concentrations in each of the tanks will be reviewed and compared with composition specifications established to maximize tank system life expectancy. The intent of this review is to permit conclusions to be made about current conditions and life expectancy of the tank system.

4.1.4 Leak Testing and Examinations

A precision leak test of each 1,000,000 gallon DST containing radioactive mixed waste will not be performed. The solid wastes contained in the lower part of the tanks, along with the significant capacity of the tanks, makes leak testing by hydrostatic means impractical. The solid waste would have to be removed to get an accurate test result and this would result in significant exposure and waste generation. The use of a non-volumetric leak test, such as a tracer gas, is also not practical. The combination of the large volume of gas required, likelihood of solids interference, and the significant air flow in the tank and annulus make this test undesirable.

Due to the impracticality of leak testing described above, examinations will be performed as appropriate by visual methods and remote non-destructive testing. The two selected methods are as follows:

Visual Tank Examination

A visual examination of the primary and secondary tanks is being performed remotely through the use of Closed Circuit Television (CCTV). The CCTV examination is intended to identify general corrosion, visible cracks, potential leak sites, and other evidence of physical impairment.

The CCTV examination is being performed by inserting a video camera into the annulus space of each Double-Shell Tank (DST), as shown in Figure 4-1. The examination consists of a scan from top to bottom of both the primary and secondary tank walls. Areas of particular interest include the lower knuckle area of both the primary and secondary tanks, the concrete edge below the primary tank, and the exit opening of drainage slots in the insulating concrete slab. The major elements of this examination are:

Equipment Selection and Fabrication

Video equipment was selected based upon riser access requirements of the DST annulus space. The selected camera is a color camera with zoom lens and light supply. This video equipment was then adapted for remote operation through the use of various housings and mechanical positioning equipment. The capability to determine depth, azimuth and tilt of the video camera was also incorporated into the overall design.

This video equipment was then combined with a video imprinting system and a video recorder. The imprinting system allows for recording of the input from the camera, as well as imprinting on the picture the following information:

- time and date of examination,
- tank and riser location being examined,
- depth, azimuth, and tilt.

Acceptance Testing of Equipment

A mock-up of a portion of the annulus space of a Double-Shell Tank was fabricated to assist in testing of the video equipment. An acceptance test was then performed on the equipment. This acceptance test ensured that the equipment could be operated properly in a remote situation. The test also determined optical sensitivity of the camera by using visual examination standards.

Field Examinations

Field examinations are done by tank farm (AN, AP, AW, AY/AZ, SY, and DCRT's) and consist of two entries into the annulus space of each tank. Access points for the two entries into each tank will be selected based upon available risers. The two points will be selected to be as close to 180 degrees apart as possible.

The field examination team consists of the examination engineer and support personnel to operate the remote camera equipment. A full scan of the exterior side of the primary tank and the interior side of the secondary tank is accomplished in each riser. Areas of interest are identified by the examination engineer. Adjustments to magnification, lighting, and camera angle (different depths) are utilized to characterize any area of interest.

Preliminary field review of the video data is used to identify the need for further characterization of an area of interest. Efforts in this area can include radiological smears and/or an attempt to retrieve a sample of any material on the tank wall.

Radiological Smears - Radiological smears are accomplished by an extension attached to the camera assembly which can be used to deliver a smear pad to the area in question. The camera assembly can then be manipulated to rub the smear pad over the area in question and record the smearing event. Radiological characterization of the smear pad can be used to determine if the area has loose surface contamination, a sign of tank waste being present. Background smears would also be taken from areas that are not suspected of having leaked material. These would be utilized as a baseline of the overall annulus contamination level, as waste materials are not expected in the annulus space.

Sample Retrieval - A device has been designed which could potentially take a sample of any material protruding from the tank wall. This device uses a simple spring loaded scraper that scrapes any protruding material into a container. The device would be attached to the camera assembly which records the sampling event. This device would be fabricated and utilized at the direction of the examination engineer if previous efforts fail to determine the nature of an area of interest.

Video Tape Review and Examination Report Preparation

A final review of the video tape is performed after completion of the examination in an entire Tank Farm. Any area of interest that is identified during the final review, that had not previously been identified, will lead to additional field work including radiological smears and/or sample retrieval to characterize the area.

An examination report will be prepared to document the overall examination, along with identified areas of interest and their resolution. Record copies will be maintained of the examination report, examination video tape footage, and video tape footage taken during radiological smears and/or sample retrieval. Radiological smears and samples will also be archived, as appropriate.

Double-Shell Tank Annulus Close-Circuit Television Inspection

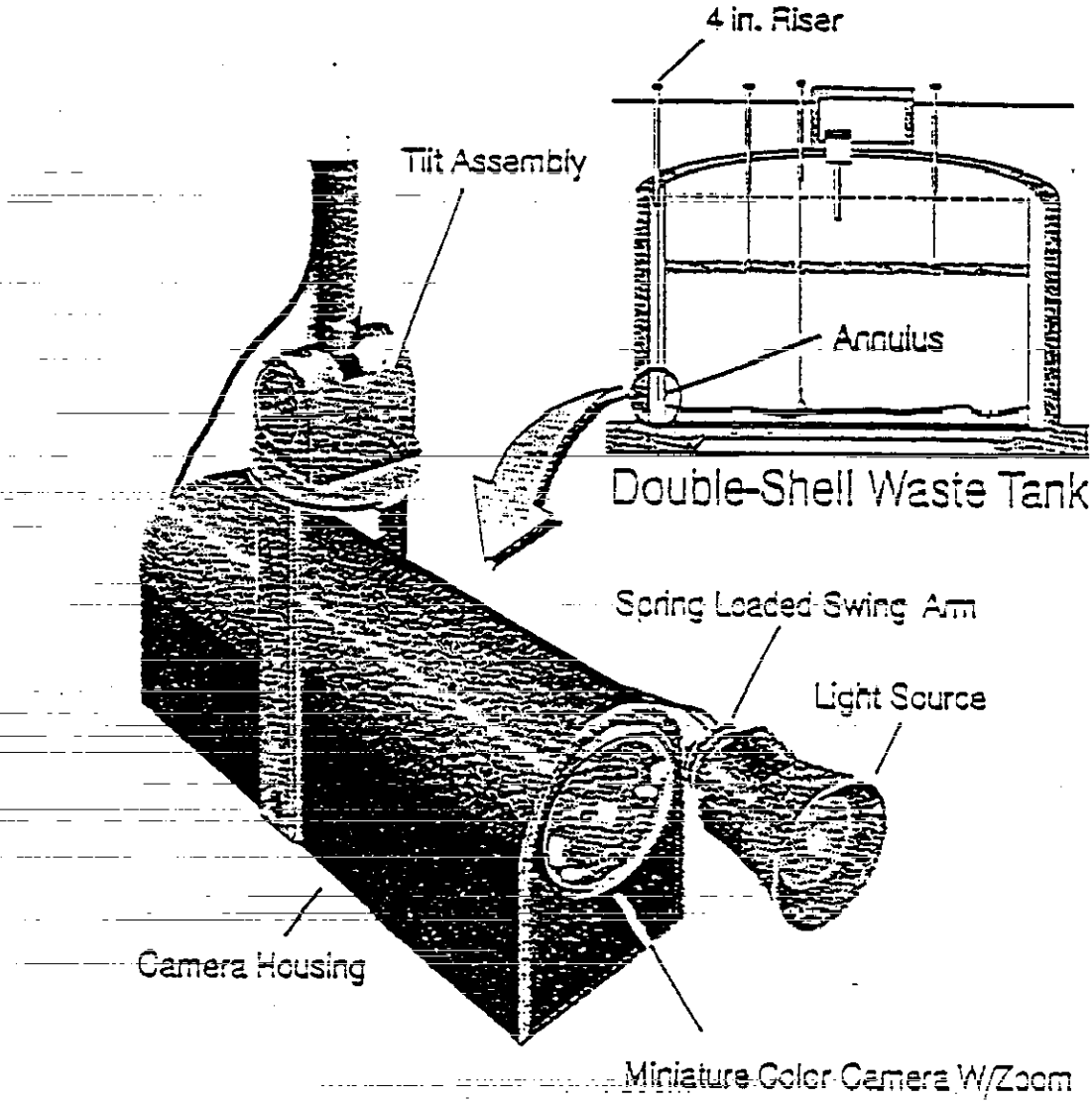


Figure 4-1

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Primary Tank Examination - Ultrasonic Testing

Remote Ultrasonic Testing (UT) equipment will be developed, tested, and utilized as part of the DST integrity assessment. This type of remote, underground examination has not been performed to date on the Hanford Site and will involve a large amount of development and testing. The equipment will be utilized to examine wall thickness and corrosion cracking at select locations on the primary tank. The UT will be performed at two annulus risers approximately 180 degrees apart.

Development of UT equipment will be a combined effort between Westinghouse Hanford Company and a commercial vendor with expertise in UT equipment and robotics. A basic flowsheet of this development effort is described in Figure 4-2. The major efforts include:

Vendor Selection and Contract Award - A competitive procurement will be utilized in selection of the vendor. This will ensure that the UT equipment can be procured in a cost effective manner. This process was initiated with a Business Commerce Daily announcement in January 1991.

Expert Consultant Review - A panel of consultants familiar with state of the art UT equipment will be established to provide technical oversight of the UT development effort and actual performance of the inspection.

Notch Standard and Cracked Plate Fabrication - Notch standards and simulated cracked plates will be prepared for acceptance testing of the equipment and training of personnel. The notch standards will be prepared using standard machining processes. The stress corrosion cracked plates will be prepared by causing cracking of stressed plates under an environment similar to the caustic nature of the Double-Shell Tanks.

Mock-up Construction - A mock-up will be developed of the Double-Shell Tank annular space for acceptance testing of the UT equipment, training of personnel, and for recertification of the UT equipment for future inspections.

Data Management Plan and System - A data management plan and system will be developed to ensure that data is properly recorded, interpreted, differences of interpretation are resolved, and findings properly recorded and presented to management.

Quality Assurance Program - Quality assurance requirements specific to the UT program will be developed. This program will establish the requirements for certification of the UT equipment, training and certification of personnel involved in the inspection, and the process for interpretation of the data.

UT EXAMINATION OF DOUBLE SHELL WASTE TANKS

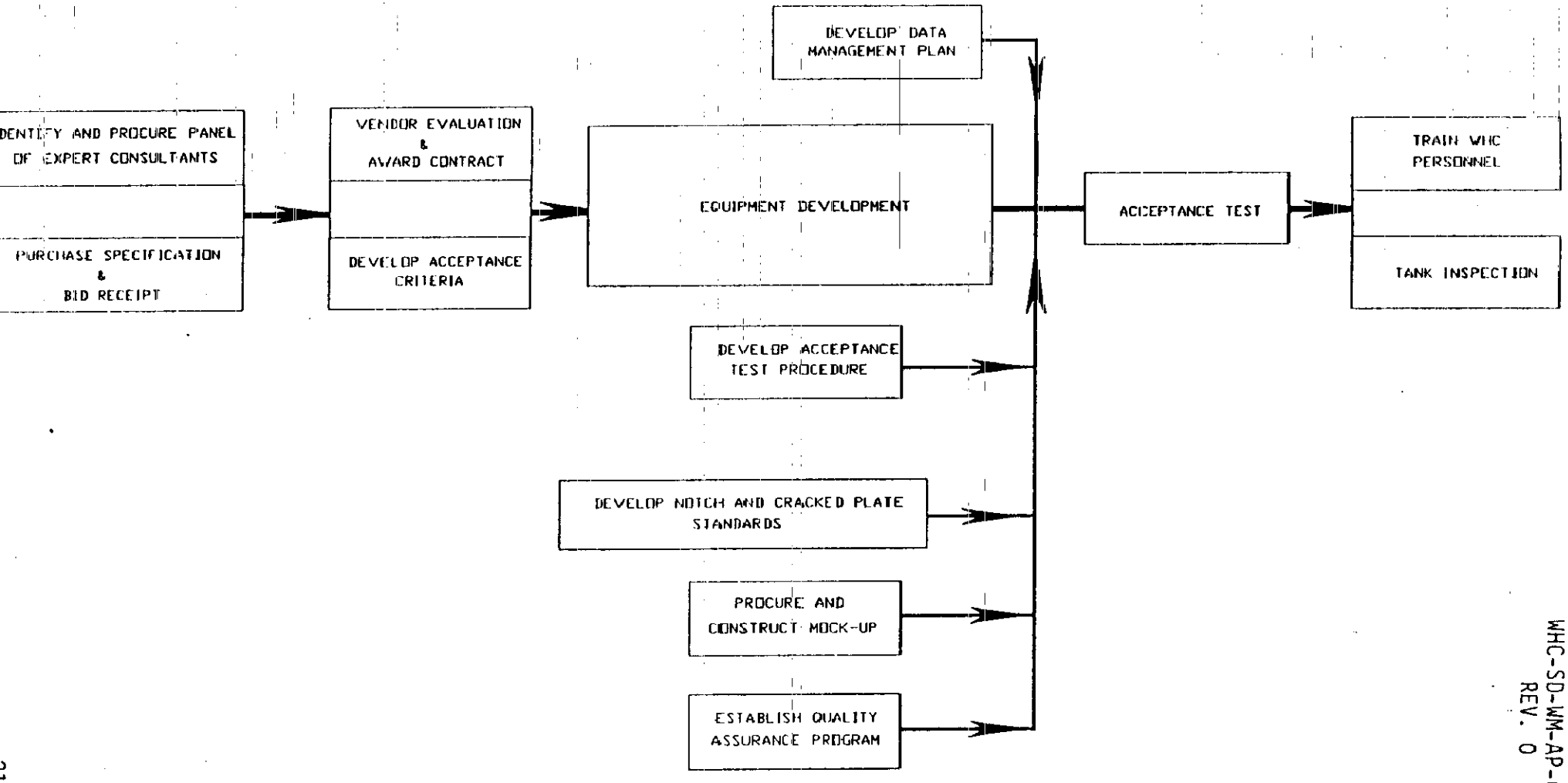

Figure 4-2

Tank Leak Evaluation

A leak evaluation will also be performed through a review of operational monitoring records. The DSTs are monitored on a continuous basis by several leak detection methods. These represent an ongoing leak evaluation of the tank system.

Ancillary Equipment Examinations

Leak testing of the DST piping system is also performed on an ongoing basis during operation of the facility. From an integrity standpoint the testing-during-use approach is considered adequate. In addition to the ongoing testing, UT and visual inspections will be performed on select components of the transfer system as part of this assessment.

4.1.5 Integrity Assessment Reports

An integrity assessment report (IAR) will be issued following the completion of assessment work for each tank farm. The report will include specific conclusions and recommendations regarding the integrity and life expectancy of the system components. Future use of the system for management of the wastes will also be addressed. The IAR will be certified by an IQRPE and will include a recommendation for the frequency and nature of future integrity assessments for that facility.

In addition to the final IAR, specific interim reports may be written to document completion of major portions of the assessment for a tank farm. These individual reports may consist of a tank report, UT report, and ancillary equipment report. The results of these reports will be compiled in the final IAR for each facility.

4.2 242-A EVAPORATOR INTEGRITY ASSESSMENT

4.2.1 Integrity Assessment Plan

The "242-A Evaporator - Crystallizer Tank System Integrity Assessment Plan" (WHC-SD-WM-WP-062) was written to establish the inspections, tests and evaluation procedures required to assess the integrity of the 242-A Evaporator-Crystallizer facility. This integrity assessment plan (IAP) has been approved by the operator of the facility (WHC) and has been accepted by an IQRPE.

The major tasks that will be performed as part of this assessment include:

Design Standard Comparison

A comparison will be performed of the original facility design standards against the current design standards to identify differences that may effect structural integrity of the evaporator system. Technical differences will be dispositioned through engineering analysis of the variances or through upgrades to the facility.

Waste Characteristics, Compatibility and Corrosion Protection

Data on waste characterization, evaporator system age, and system materials will be compiled and an evaluation will be performed on the compatibility of the system with the waste. The assessment will also compile a listing of materials utilized in the system and analyze the corrosion potential within the waste stream environment. The assessment will permit conclusions to be made about current conditions and life expectancy of the evaporator system.

Leak Testing

Leak testing will be performed on various portions of the tank system through the use of hydrostatic testing.

Inspections

Critical portions of the system will be examined for evidence of degradation and deformation due to corrosion, erosion, mechanical stresses, and fatigue. A walkdown of components will be performed using certified visual inspectors. Ultrasonic testing (UT) for wall thickness will also be performed on critical components.

4.2.2 Integrity Assessment Report

An integrity assessment report (IAR) will be issued following the completion of the assessment. This report will include specific conclusions and recommendations regarding the integrity of system components and use of the system for management of the wastes. The IAR will be certified by an IQRPE and will include a recommendation for the frequency and nature of future integrity assessments.

In addition to the final IAR, specific letter reports will be written to document completion of various portions of the assessment. The results of these reports will be compiled in the final IAR. The letter reports will serve a purpose for both progress reporting and as historical documentation of work performed.

5.0 TASK MILESTONES AND SCHEDULES

5.1 DOUBLE-SHELL TANK MILESTONES AND SCHEDULES

5.1.1 Task Milestones

The following milestones have been identified for performance of the DST integrity assessment:

Fiscal Year 1991:

Complete CCTV examination of AW DSTs	September 1991
Issue Performance Specification for UT device	September 1991

Fiscal Year 1992:

Identify UT Vendor	February 1992
Identify Procurement Milestones for UT Device	May 1992
Complete CCTV examination of all DSTs and issue a report on conclusions reached	September 1992

Fiscal Year 1993/1994:

Issue IAR for AW Tank Farm	February 1993
Issue IAR for AY/AZ Tank Farm	April 1993
Issue IAR for DCRTs	August 1993
Issue IARs for AN, AP, and SY Tank Farms	September 1994

5.1.2 Schedule

Integrity assessment efforts during Fiscal Year (FY) 1991 focused on overall integrity assessment planning along with performance of some examinations in the AW DST farm. The following specific tasks were performed:

- The IAP for AW Tank Farm was written, approved by WHC, and approved by the IQRPE.
- A visual inspection (CCTV) of each of the six AW DSTs was completed.
- The AW Tank Farm design standard - structural integrity assessment was completed and a draft report was circulated for review.
- Work planning for ancillary equipment was completed and is awaiting field performance. This includes procedures to perform pit entry/examination and transfer line excavation/inspection/UT.
- Efforts were begun for competitively procuring remote Ultrasonic Testing equipment for DSTs. The performance specification for the UT equipment was issued and procurement authorization was approved by WHC and sent to Department of Energy Field Office, Richland, WA (RL) for approval.

- The IAP for the DCRTs was written, approved by WHC, and accepted by the IQRPE.

Efforts for FY 1992 will focus on completion of the visual inspections (CCTV) of the remaining DSTs and procurement of UT equipment. A schedule of FY 1992 activities is shown in Figure 5-1.

Efforts for FY 1993 and FY 1994 will focus on final development and certification of the UT equipment, actual Ultrasonic Testing of DSTs and completion of the remaining integrity assessment activities for the DST system. A schedule for these activities is shown in Figure 5-2.

5.2 242-A EVAPORATOR SCHEDULE

Integrity assessment efforts during FY 1991 focused on integrity assessment planning and field inspections. The following specific tasks were performed:

- The IAP was written, approved by WHC and the IQRPE
- A visual walkdown of the facility was completed
- Ultrasonic testing of designated portions of the tank system was completed
- Design standard - structural integrity assessment work was begun
- The waste characteristics, compatibility and corrosion protection review was begun

Fiscal year 1992 activities will focus on completion of examinations, leak testing, and the final integrity assessment report. The final IAR will be issued approximately 1 month after restart of the facility. The timing is due to the fact that the remaining field work relies upon operational testing of the facility that will be performed as part of the restart process. All findings that represent a safety concern for operation of the facility will be dispositioned prior to restart of the facility.

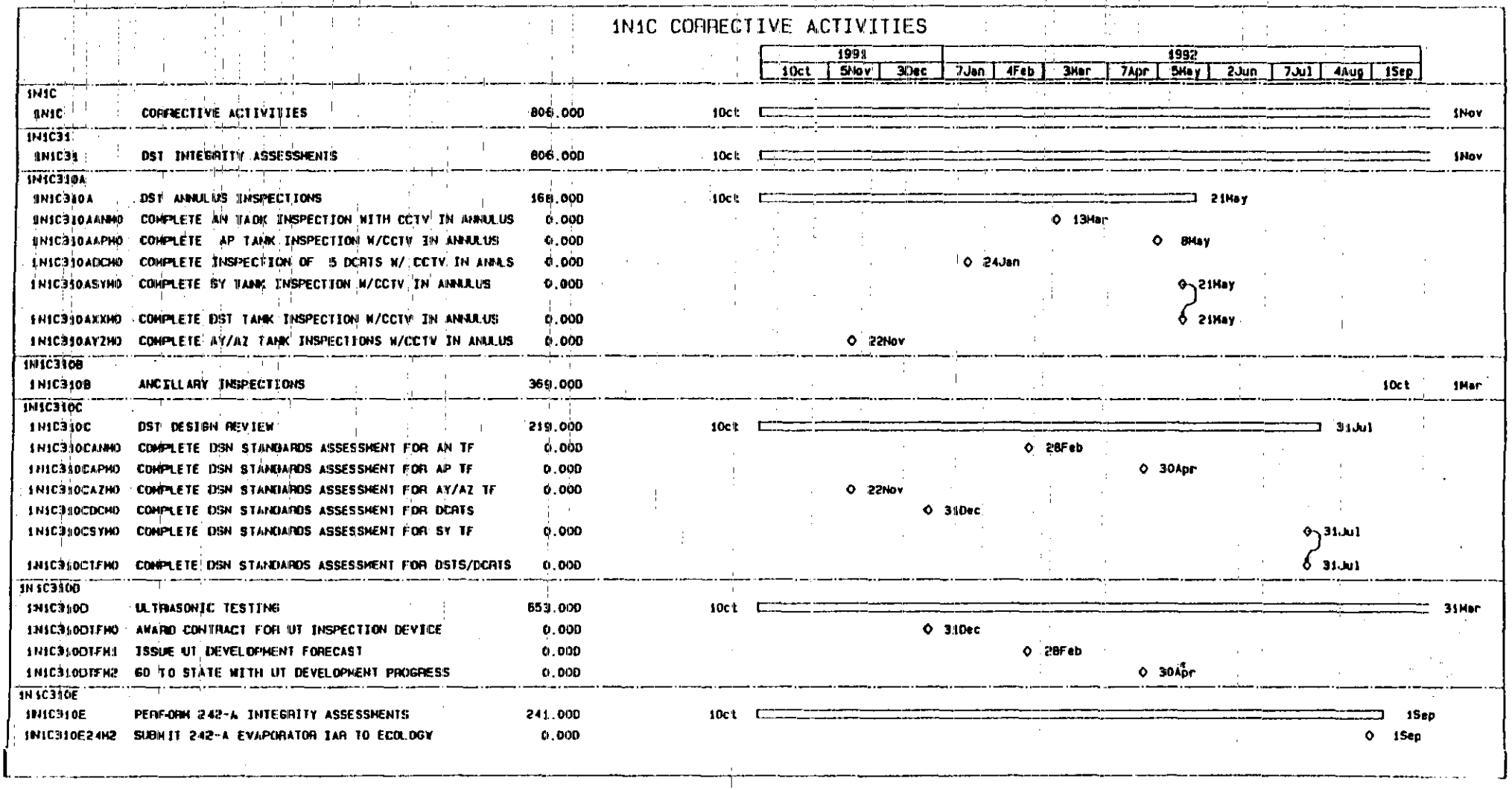

Figure 5-1

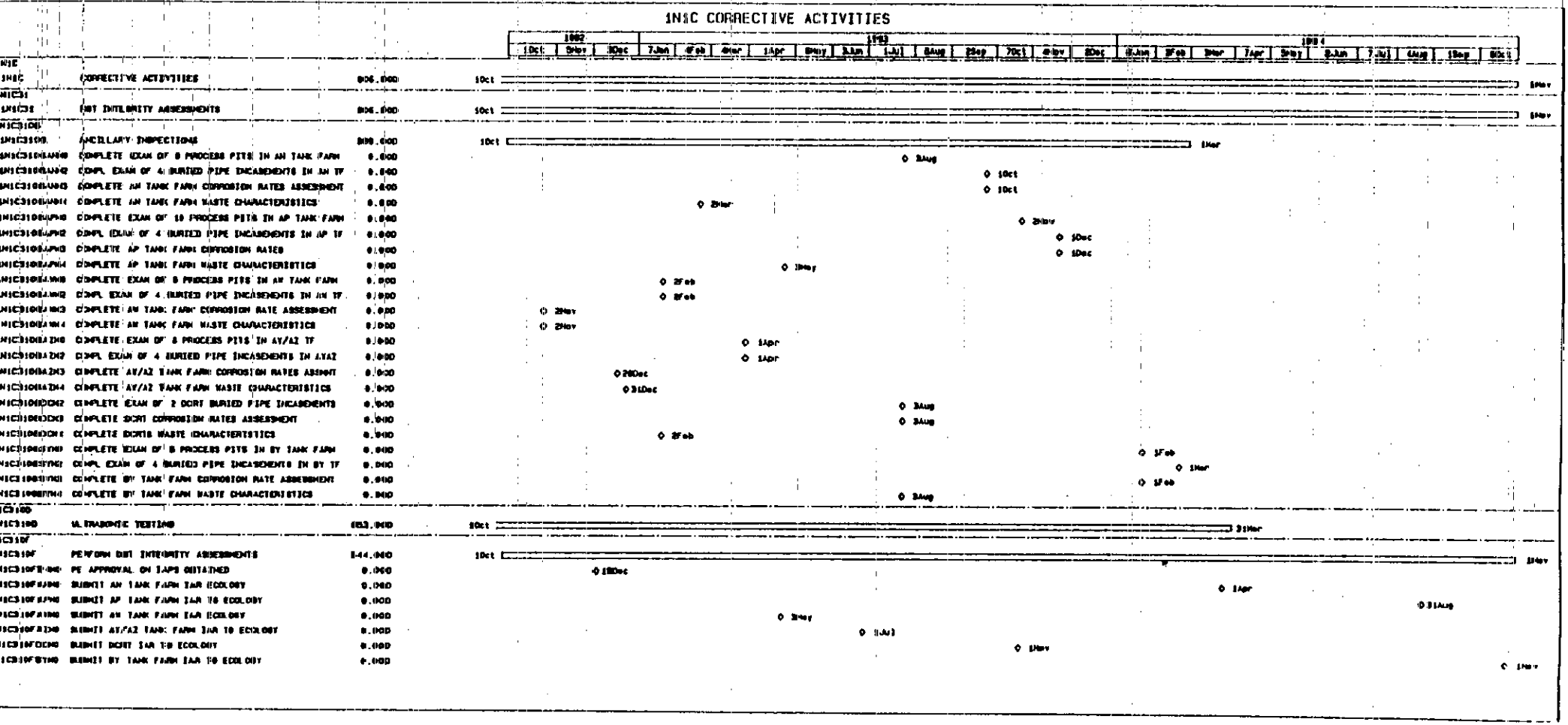

Figure 5-2

6.0 REFERENCES

1. State of Washington, Washington Administrative Code, Chapter 173-303, "Dangerous Waste Regulations", March, 1991.

2. WHC-SD-WM-ES-156, Rev. 0, "Catch Tanks Environmental Upgrade for Tank Farms".

3. WHC-SD-WM-ES-160, Rev. 0, "Transfer Lines Environmental Upgrade for Tank Farms".

4. WHC-SD-WM-ES-159, Rev. 0, "Diversion Boxes Environmental Upgrades for Tank Farms".

5. WHC-SD-WM-ES-157, Rev. 0, "Seal Pots and Associated Drain Piping Environmental Upgrades for Tank Farms".

6. WHC-EP-0392, "Tank Farms Upgrades Program Plan", June 1991.

7. WHC-SD-WM-WP-057, Rev. 0, "Integrity Assessment Plan for 241-AW Tank Farm and Designated Ancillary Equipment".

8. WHC-SD-WM-WP-062, Rev.0, "242-A Evaporator - Crystallizer Tank System Integrity Assessment Plan".

9. WHC-SD-WM-EV-040, Rev.1, "Double-Shell Tank Ancillary Equipment Secondary Containment Evaluation".

APPENDIX A

A.1 ITEMS TO BE SUBJECTED TO INTEGRITY ASSESSMENT

The tanks and ancillary equipment items that will be subjected to integrity assessments are listed below by Tank Farm.

A.1.1 AW Tank Farm

Items assessed include:

1. Tank 241-AW-101
2. Tank 241-AW-102
3. Tank 241-AW-103
4. Tank 241-AW-104
5. Tank 241-AW-105
6. Tank 241-AW-106
7. Slurry lines 162-169 (161 is out of service), 509 and 510
8. Supernatant lines 219-220, 261-272, 274, 609, 610, V-021, V-022 and V-023
9. Drain lines 334, 335,361, and 369
10. Process waste lines 471-476
11. 241-AW 101-106 central, annulus, drain, and feed pump pits
12. 3 inch drains to central pump pits 01A, 02A, 03A, 04A, 05A, 06A
13. 3 inch drains to annulus pump pits 01B, 02B, 03B, 04B, 05B, 06B
14. 3 inch drains to feed pump pit 02E
15. 3 inch drain to drain pit 02D

A.1.2 AY/AZ Tank Farms

Items assessed include:

1. Tank 241-AY-101
2. Tank 241-AY-102
3. Tank 241-AZ-101
4. Tank 241-AZ-102
5. Process waste line NHW-V-714, NCAW and NHW from AR-151 to AX-155 Diversion Box
6. Drain line DR-V-713 from AX-152 diversion box to AX-155
7. Process waste line PSW-4622 from AZ-01B pump pit to AZ-01A pump pit
8. Process waste line PSW-4623 from AZ-01A pump pit to AZ-01F sluice Pit
9. Process waste line PSW-D603 from AZ-152 diverter box to AZ-01A pump Pit
10. Process waste line PSW-D608 from AZ-02C sluice pit to AZ-02A pump Pit
11. Process waste line PSW-$608 from AZ-01B pump pit to AZ-152 diverter box
12. Process waste line PSW-5609 from AZ-01C sluice pit to AZ-152 diverter box
13. Process waste line PW-4621 from AZ-01C sluice pit to AZ-01A pump pit
14. Process waste line PW-481; condensate from A-350 drainage lift station to and inside 242-A evaporator

15. Slurry line SL-104 from valve pit A-A to A-B valve pit
16. Slurry line SL-110 NCAW from valve pit AX-A to AX-B valve pit
17. Slurry line SL-501 from pump pit AZ-02A to AZ-01A pump pit
18. Slurry line SL-503 NCAW from sluice pit AY-02D to AY-02A pump pit
19. Slurry line SL-503 NCAW from pump pit AY-02A to AY-01D sluice pit
20. Slurry line SL-505 NCAW from sluice pit AY-01D to AY-01A pump pit
21. Supernatant line SN-201/214 B Plant complexed and noncomplexed waste from valve pit AX-A to A-A valve pit
22. Supernatant line SN-204 B plant complexed and noncomplexed waste from valve pit A-A to A-B valve pit
23. Supernatant line SN-200/213 B Plant complexed and noncomplexed waste from valve pit AX-B to A-B valve pit
24. Supernatant line SN-210 NCAW from valve pit AX-A to AX-B valve pit
25. Supernatant line SN-601 NCAW from sluice pit AZ-02B to AZ-01C sluice Pit
26. Waste line S-607 NCAW from sluice pit AZ-02B to AZ-0@A pump pit
27. Waste line V-720 NCAW from AR-151 to AY-02D sluice pit
28. Process waste line V-719 NCAW from AX-155 to AX-152 diversion box
29. Line SL-500 from valve pit AX-A through COBs to AZ-02A pump pit
30. Line SL-502 from AX-B valve pit through COBs to AY-02D sluice pit
31. Line SN-600 from valve pit AX-A through COBs to AZ-02B pump pit
32. Line SN-100 from valve pit A-B through COBs to AX-B valve pit
33. Line SL-101 from valve pit A-A through COBs to AX-A valve pit
34. Line SL-113 from 242-A through COBs to valve pit A-B
35. Line SL-114 from 242-A through COBs to valve pit A-A
36. Pump pits 241-AY-01A, AY-02A, AZ-01A, and AZ-02A
37. Sluice pits 241-AY-01B, -02B, -01C, -01D, -02D, -01E, -02E, 241-AZ-01B, -02B, -01C, and -02C
38. 241 A-350 Drainage lift station

A.1.3 Double-Contained Receiver Tanks (DCRT) And Designated Ancillary Equipment

The five DCRT systems that are to be assessed are listed below:

1. 244-S Catch Station
2. 244-A Lift Station
3. 244-TX Catch Station
4. Catch Station (spare)
5. 244-BX Salt Well Station

The assessment is to include the receiver tanks (primary containment), the tank vaults (secondary containment), pump pits (secondary containment), and ancillary waste processing equipment and piping contained within the DCRT facility structures.

It will be decided later if the 244-U Catch Station and/or 244-BX Salt Well System are to be used for future waste transfer operations, or if their use will be discontinued. If either system is to be used, it must be subjected to an integrity assessment. For purposes of planning WHC SD-WM-WP-068 (Integrity Assessment Plan for the Double-Contained Receiver Tanks and Designated Ancillary Equipment) addresses all five DCRT systems.

A.1.4 AN Tank Farm Items To Be Subjected To Integrity Assessment

The tanks and equipment items that will be subjected to integrity assessment are listed below:

1. Tanks AN-101, -102, -103, -104, -105, -106, -107

2. AN Cleanout Boxes 1 through 6, these are associated with transfer lines SL-160 and SN-260

3. AN Cleanout Boxes 7, 8, and 9, these are associated with transfer lines SL-161, SN-261; SL-164, SN-264; and SL-167, SN-267 respectively

4. AN-102 - 107 Central Pump Pits and associated transfer lines:

   a. SL-162 - 167 and SN-262 - 267

   b. 3 in. drains to Central Pump Pits 02A, 03A, 04A, 05A, 06A and 07A.

5. AN-101 Central Pump, Saltwell Receiver Pits, and the following associated transfer lines:

   a. SL-161, SN-261, and SN-247

   b. 3 in. drain to Central Pump Pit 01A

   c. 3 in. drain to Saltwell Receiver Pit 01E.

6. Lines SL-168 and Sn-268, these are associated with valve pits AN-A and -B.

2.1.5 AP Tank Farm Items To Be Subjected To Integrity Assessment

The tanks and equipment items that will be subjected to integrity assessment are listed below:

1. Tanks 241-AP-101, -102, -103, -104, -105, -106, -107, -108

2. Slurry lines SL-511 through SL-518

3. Supernatant 1 lines SN-611 through SN-618, SN-621, SN-622, and SN-650

4. Central pump pits 241-AP-01A through 241-AP-08A (tanks 101-108), pump pit 241-AP-02D, drain put 241-AP-03D, and K1 primary exhaust station (includes K1 seal pot pit)

5. Drain lines 2" DR-712 and 3" DR-713 (from the 241-AP valve pit to drain pit 241-AP-03D) and 4" drain line DR-716 (from the primary exhaust station to drain pit 241-AP-03D)

6. Three inch drain lines from central pump pits, 241-AP-01A through 241-AP-08A, to their respective tanks via the 12 inch risers (Riser #3)

7. Three inch drain line from pump pit 241-AP-02D to tank 241-AP-102 via the 12 inch riser (Riser #13)

8. Three inch drain line from drain pit 241-AP-03D to tank 241-AP-103 via the 12 inch riser (Riser #10)

A.1.6 SY Tank Farm Items To Be Subjected To Integrity Assessment

The tanks and equipment items that will be subjected to integrity assessment are listed below:

1. Tanks SY-101, SY-102, and SY-103

2. SY-101 and SY-103 Central Pump Pits 01A and 03A and associated transfer lines:
   a. 01A: SN-278, SL-178 and pit drain line
   b. 03A: SN-279, SL-179 and pit drain line

3. SY-102 Central Pump Pit 02A, Drain Pit 02D and associated transfer lines:
   a. 02A: SN-277, SN-285, SN-286, SL-177, and pit drain line
   b. 02D: DR-376, DR-379 and pit drain line

4. Transfer lines associated with valve pits SY-A and B:
   a. SY-A: SN-275, SN-280, SL-175, SL-180
   b. SY-B: SN-276, SN-282, V-561